In [33]:

```
import numpy as np
import scipy
import matplotlib.pyplot as plt
%matplotlib inline
%pylab inline
```

```
Populating the interactive namespace from numpy and matplotlib

/home/fartuk/anaconda2/lib/python2.7/site-packages/IPython/core/magic
s/pylab.py:161: UserWarning: pylab import has clobbered these variable
s: ['entropy', 'rayleigh', 'norm', 'uniform', 'poisson', 'wald', 'samp
le', 'f', 'reciprocal', 'gamma', 'dirichlet', 'randint', 'beta', 'logi
stic', 'laplace', 'vonmises', 'chisquare', 'bartlett', 'trapz', 'zip
f', 'multivariate_normal', 'histogram', 'pareto']
`%matplotlib` prevents importing * from pylab and numpy
  "\n`%matplotlib` prevents importing * from pylab and numpy"
```

In [45]:

```
# Парамаетры
tetta = 1.0
tetta5 = 10.0
lambda5 = 1.0
alpha = 0.95
```

# Равномерное

In [185]:

```
sample = scipy.stats.uniform.rvs(size=100, scale=tetta)
```

In [186]:

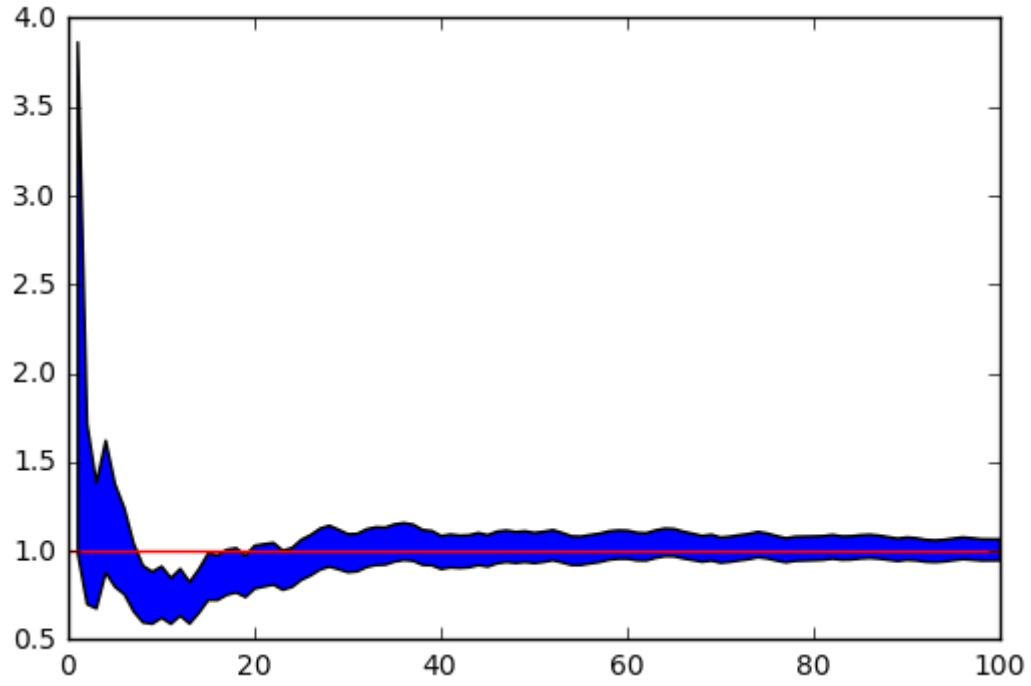
```
# Оценки по X_
def T1(sample, alpha):
    return (np.mean(sample))/((1.0/2) - (1.0 / np.sqrt(12.0 * alpha * len(sample))))

def T2(sample, alpha):
    return (np.mean(sample))/((1.0/2) + (1.0 / np.sqrt(12.0 * alpha * len(sample))))
```

In [187]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta,color='red')
```

Out[187]:

```
<matplotlib.lines.Line2D at 0x7fbe8efbb190>
```




In [188]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
0.7
0.9
```

In [62]:

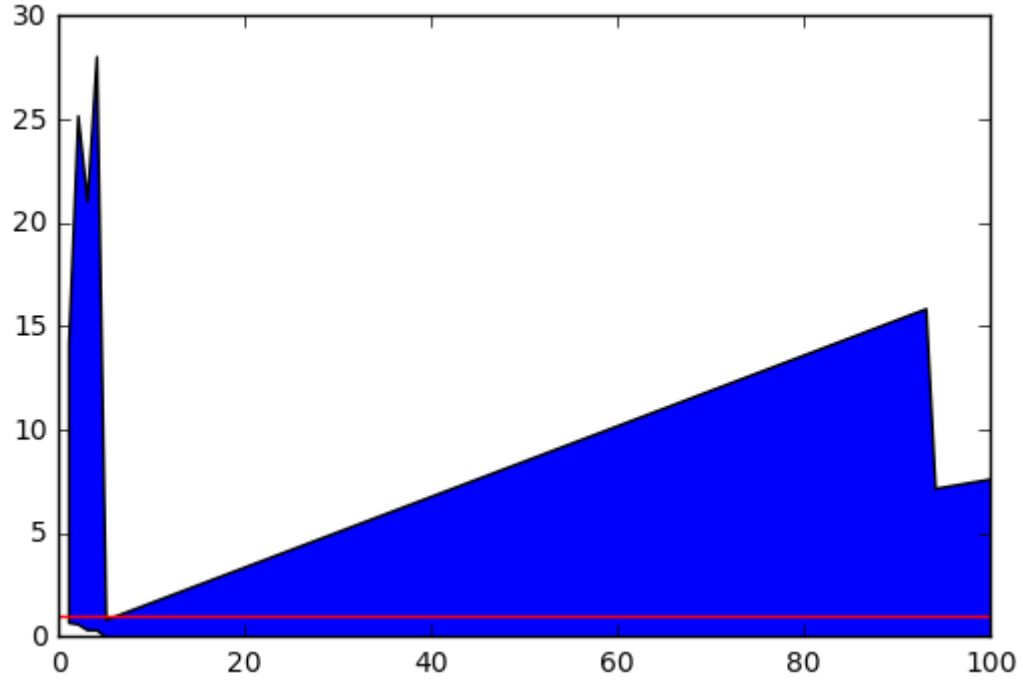
```
# Оценки по X(1)
def T1(sample, alpha):
    return min(sample)/(1 - (pow(alpha,1.0/i)))

def T2(sample, alpha):
    return min(sample)
```

In [63]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta,color='red')
```

Out[63]:

<matplotlib.lines.Line2D at 0x7fbe906822d0>



In [64]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
0.9
0.99
```

In [69]:

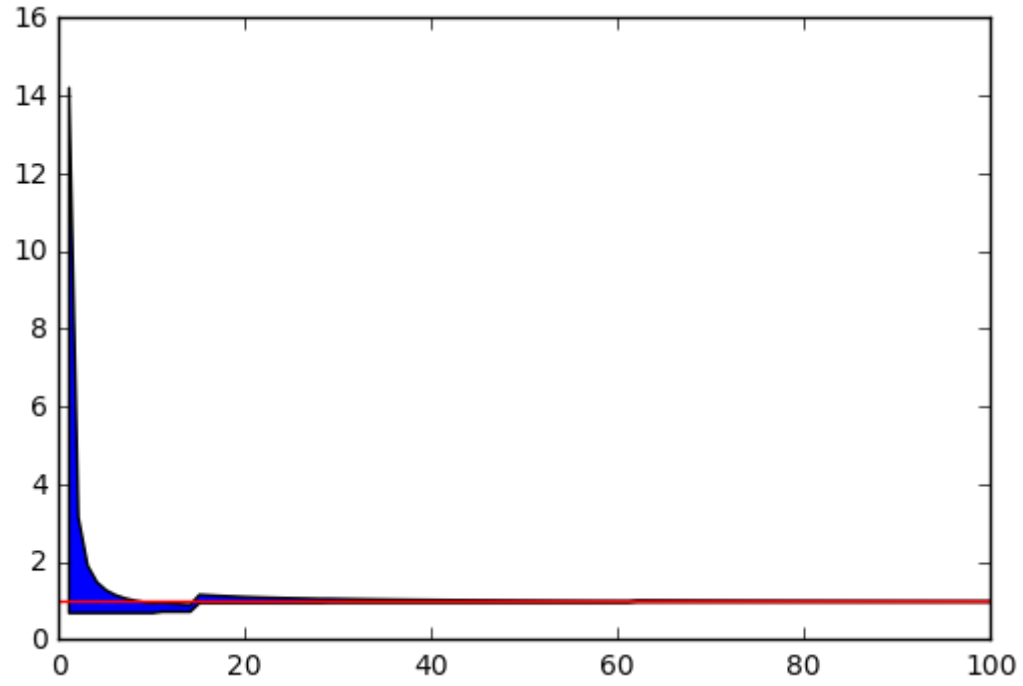
```
# Оценки по X(n)
def T1(sample, alpha):
    return max(sample)/(pow(1.0-alpha,1.0/len(sample)))

def T2(sample, alpha):
    return max(sample)
```

In [70]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta,color='red')
```

Out[70]:

```
<matplotlib.lines.Line2D at 0x7fbe9038b6d0>
```




In [71]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
0.8
0.94
```

# Коши

In [80]:

```
sample = scipy.stats.cauchy.rvs(size=100, loc=theta)
```

In [85]:

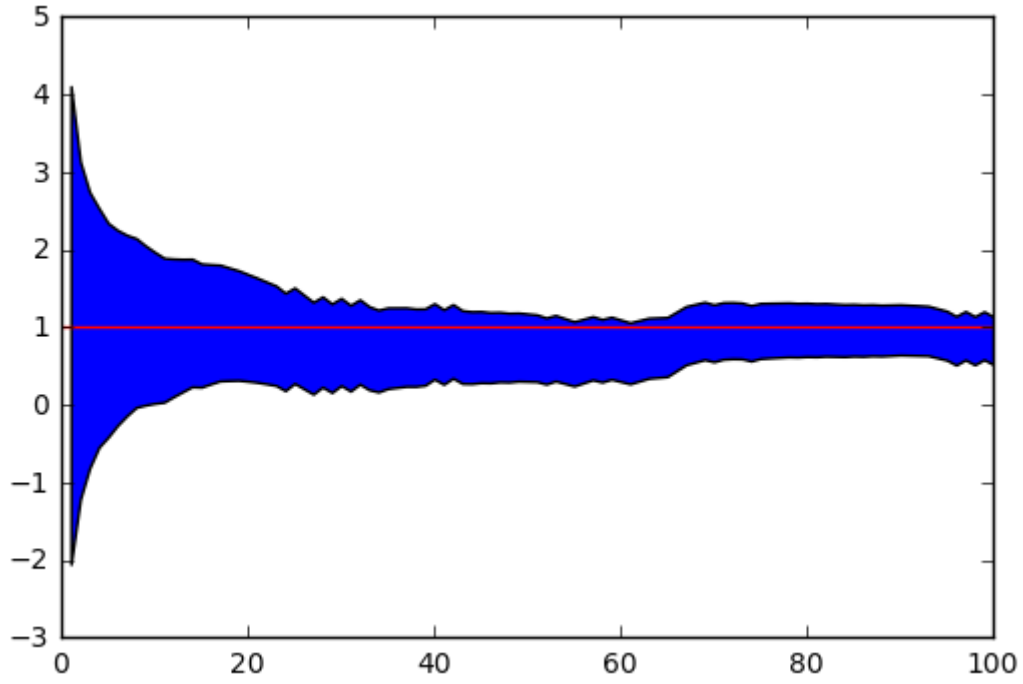
```
pi = 3.14159268
def T1(sample, alpha):
    return np.median(sample[:i]) + (scipy.stats.norm.ppf((1+alpha)/2.0) * (pi/(2*sq

def T2(sample, alpha):
    return np.median(sample[:i]) - (scipy.stats.norm.ppf((1+alpha)/2.0) * (pi/(2*sq
```

In [86]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta,color='red')
```

Out[86]:

```
<matplotlib.lines.Line2D at 0x7fbe90360710>
```



In [87]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
1.0
1.0
```

# Пуассон

In [102]:

```
sample = scipy.stats.poisson.rvs(size=100, mu=tetta)
```

In [103]:

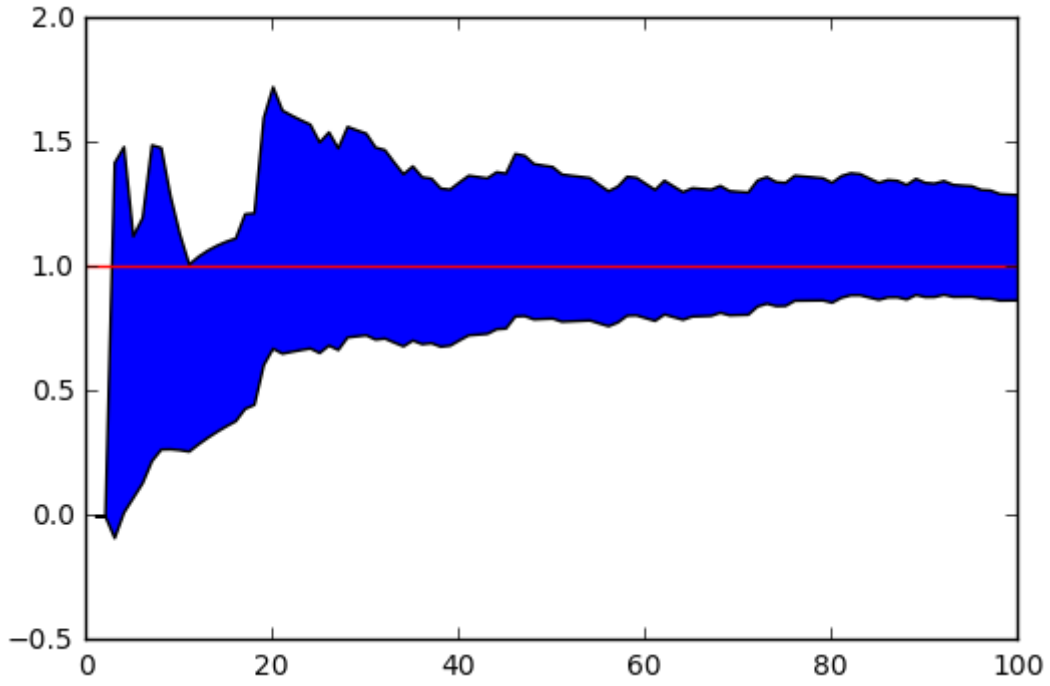
```
pi = 3.14159268
def T1(sample, alpha):
    return np.mean(sample) * (1 + (scipy.stats.norm.ppf((1.0+alpha)/2)/(np.sqrt(len

def T2(sample, alpha):
    return np.mean(sample) * (1 - (scipy.stats.norm.ppf((1.0+alpha)/2)/(np.sqrt(len
```

In [104]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta,color='red')
```

Out[104]:

```
<matplotlib.lines.Line2D at 0x7fbe9001e090>
```




In [105]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
0.8
0.98
```

# Гамма

In [166]:

```
sample = scipy.stats.gamma.rvs(1, 10, size=100)
```

In [170]:

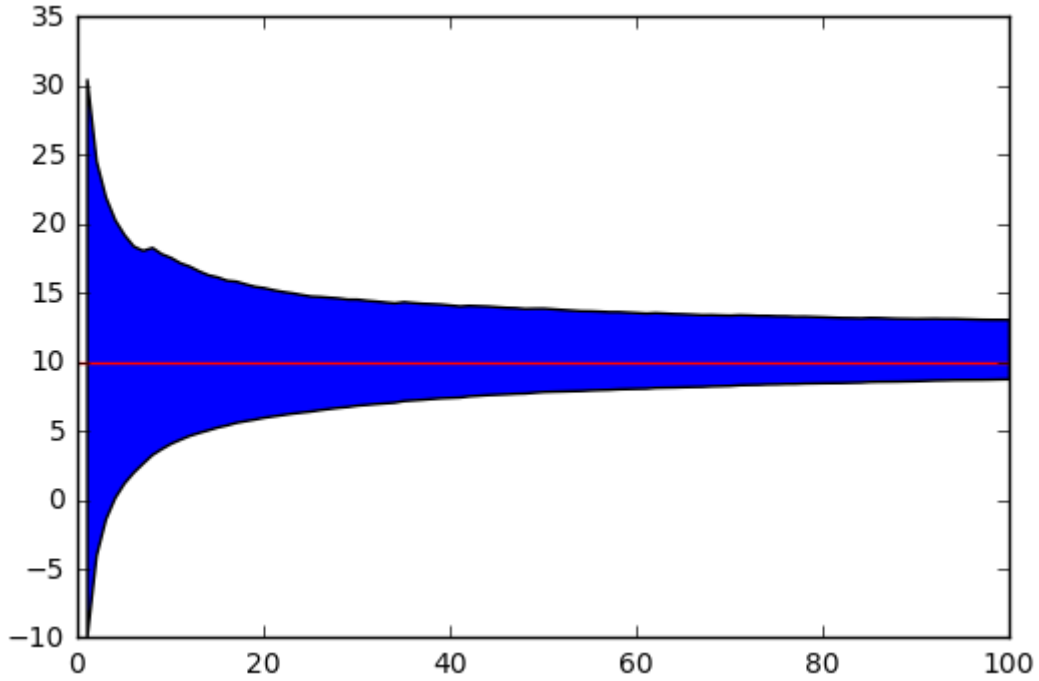
```
def T1(sample, alpha):
    return mean(sample) * (1.0 + (scipy.stats.norm.ppf((1.0+alpha)/2)/sqrt(lambda5*

def T2(sample, alpha):
    return mean(sample) * (1.0 - (scipy.stats.norm.ppf((1.0+alpha)/2)/sqrt(lambda5*
```

In [171]:

```
T_1 = []
T_2 = []
for i in range(1, 101):
    T_1 += [T1(sample[:i], alpha)]
    T_2 += [T2(sample[:i], alpha)]
plt.fill_between(range(1, 101), T_1, T_2)
plt.axhline(y=tetta5,color='red')
```

Out[171]:

```
<matplotlib.lines.Line2D at 0x7fbe8f312210>
```



In [172]:

```
# Оценка вероятности попадания в интервал по первым 10
true_sum = 0
for i in range(10):
    if T_2[i] < tetta5 < T_1[i]:
        true_sum += 1
print true_sum / 10.0
# Оценка вероятности попадания в интервал по первым 100
true_sum = 0
for i in range(100):
    if T_2[i] < tetta5 < T_1[i]:
        true_sum += 1
print true_sum / 100.0
```

```
1.0
1.0
```